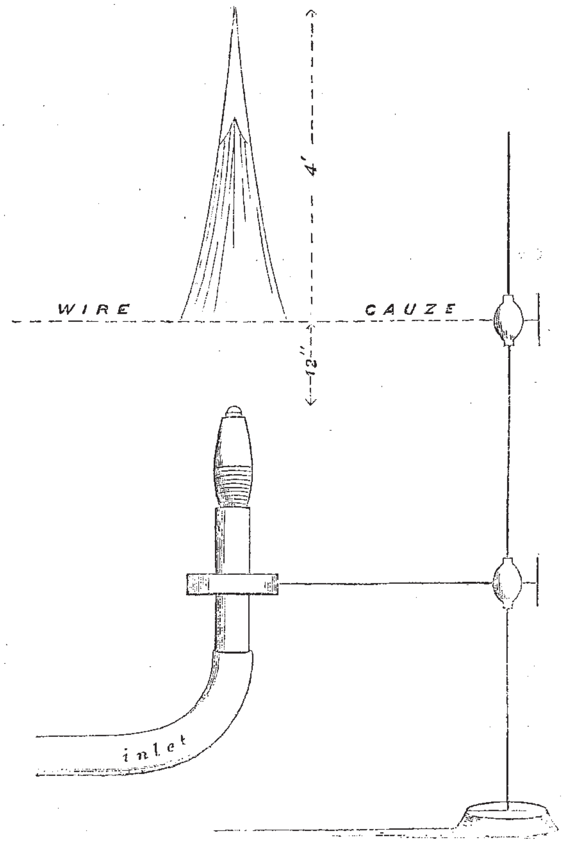
A NEW FORM OF SENSITIVE FLAME

MR. PHILIP BARRY, of Cork, has sent the following account of a new and very beautiful sensitive flame to Prof. Tyndall:—"It is in my experience the most sensitive of all sensitive flames, though from its smaller size is not so striking as your vowel flame. It possesses the advantage that the ordinary pressure in the gas mains is quite sufficient to develop it. The method of producing it consists in igniting the gas (ordinary coal gas) not at the burner but some inches above it, by interposing between the burner and the flame a piece of wire gauze.

"With a pressure of $\frac{7}{10}$ths at the burner, I give a sketch of the arrangement I adopted, the space between burner and gauze being two inches. The gauze was about seven inches square, resting on the ring of the retort-stand—ordinary window-blind wire-gauze 32 meshes to the lineal inch. The burner was Sugg's steatite pin-hole burner, the same as used for vowel flame.



"The flame is a slender cone about four inches high, the upper portion giving a bright yellow light, the base being a non-luminous blue flame. At the least noise this flame roars, sinking down to the surface of the gauze, becoming at the same time almost invisible. It is very active in its responses, and being rather a noisy flame, its sympathy is apparent to the ear as well as the eye.

"To the vowel sounds it does not appear to answer so discriminately as the vowel flame. It is extremely sensitive to A, very slightly to E, more so to I, entirely insensitive to O, but slightly sensitive to U.

"It dances in the most perfect manner to a small musical snuff box, and is highly sensitive to most of the sonorous vibrations which affect the vowel flame, though it possesses some points of difference."

NOTES

THE following telegram has been received from the English Government Eclipse Expedition:—"On board the *Mirzapore*, Malta, Saturday, November 4. We have arrived here in safety. All the members of the Eclipse Expedition are quite well, no thanks, however, to the weather, which during the voyage has been very bad. It was so bad that there was no possibility of practising with the instruments. Last night Mr. Lockyer, at the request of all on board the *Mirzapore*, gave a scientific lecture with experiments. You may form some idea of the novel character with which the lecture was invested when I state that it was blowing half a gale at the time."

SIR RODERICK MURCHISON has appointed Professor Archibald Geikie, of Edinburgh, his literary executor, and has left him a legacy of 1,000*l.* The Professor will write Sir Roderick's life, for which the deceased baronet had collected ample materials. Sir Roderick has also bequeathed to each of the professors at Jermyn Street a little remembrance of 100*l.* To the institution itself he has left the diamond snuff-box and the magnificent Siberian avanturine vase, mounted on a porphyry pedestal, presented to him by the late Emperor of Russia. He has not been unmindful of the scientific societies with which he has been so long connected. To the Geological and Geographical Societies he has bequeathed legacies of 1,000*l.* each, for the purpose of furthering the cause of science by rewarding men of science by prizes or otherwise as may be deemed proper. To old associates with him in his work he has likewise left legacies as expressions of his regard. Besides that to Mr. Geikie, sums of 350*l.* are appropriated for Prof. John Morris, Prof. T. Rupert Jones, Mr. Trenham Reeks, and Mr. Bates, and a sum of 100*l.* to Mr. C. W. Peach. We believe also that in the event of the failure of some of the heirs designated in the will, considerable sums are to go to various charitable and scientific institutions.

IN addition to the appointments to the governing bodies of the public schools, made by the Senate of the University of London, which we announced last week, the Council of the Royal Society has made the following:—Prof. P. M. Duncan, for Charterhouse; Prof. Tyndall, for Harrow; Prof. Henry J. Smith, for Rugby; Sir James Paget, Bart., for Shrewsbury; and the Rev. Prof. Price, for Winchester School.

PROF. P. M. DUNCAN, F.R.S., of King's College, has been appointed Lecturer on Geology to the India Civil Engineering College, Cooper's Hill.

WE learn from the *Pall Mall Gazette* that a mixed Committee has been appointed by the authorities of the War-Office, to conduct an inquiry into the safety of gun-cotton, and to make the necessary experiments. The committee will also be required to collect evidence with regard to its value as an explosive agent; and generally to pronounce as to the suitability and safety of the material for use in torpedoes, breaching stockades, mining, &c. The Committee consists of Colonel Younghusband, R.A., president; Colonel Milward, R.A., Colonel Gallwey, R.E., Lieutenant-Colonel Nugent, R.E., Captain Field, R.N., Dr. Odling, F.R.S., Mr. H. Bauerman, and Mr. G. Bidder, C.E. The question of the safety of the new explosive "Lithofracteur," which a German firm is anxious to be permitted to make in this country, has also been referred to the same Committee.

MR. G. M. SEABROKE, the Temple Observer at Rugby, states, in a letter to the *Times*, for the information of those who possess telescopes of moderate aperture, that Encke's comet is now within their reach. It has been examined at the Rugby Observatory with an 8¼ in. aperture, and was very plainly seen. It has somewhat the shape of a fan, and there is a marked condensation on the eastern side, being the leading portion of the comet. It would probably now be seen with a much smaller aperture than that mentioned above, and, as it is approaching us, small telescopes will probably soon show it.

THE German Astronomical Society has recently held its triennial meeting at Stutgart, under the presidency of Prof. Otto Struve. The gathering was eminently a social one; after papers read in the morning, they adjourned for excursions in the afternoon, one day visiting the birth-place of Kepler, a small town about an hour by rail from Stutgart. The inhabitants, who have recently erected a bronze statue to their great fellow townsman, decorated it with flowers for the occasion.

THE Scientific Societies have now mostly commenced their winter session. The greater number held their first meeting either last or during the present week. The first meeting of the Royal Society for the season is on November 16.

THE Annual General Meeting of the five Academies which constitute the Institute of France was held on the 25th of October, the anniversary of the day on which the Institute was established by the famous Directory suppressed by the first Napoleon. The third Napoleon, by an Imperial decree, changed the day of the anniversary meeting from that instituted by the Republic to his *fête* day, the 15th of August. Last year the meeting was not held, and on the present occasion the original date has been resumed. The presidency of the Institute is filled each year by the president of one of the five academies in rotation, the Académie des Sciences, Académie Française, Académie des Sciences Morales et Politiques, Académie des Beaux Arts, and Académie des Inscriptions et Belles Lettres. This year it is occupied by M. Jules Simon, president of the Académie Française, to which belong M. Thiers himself and four of his colleagues in the Government, including M. Simon. The annual address for the Académie des Sciences was delivered by General Morin, and dealt chiefly with military science, especially with the inventions of the great artillery officer General Piobert.

MR. J. J. MURPHY delivered the opening address to the Belfast Natural History and Philosophical Society for the current session. It was occupied chiefly with a *résumé* of the most important fresh applications of applied science during the year.

MR. RUTHERFORD, of New York, the most eminent American amateur astronomer, and especially known for his magnificent photographs of celestial bodies, has lately presented to Mr. Brothers, the English astronomical photographer, three superb negatives of the moon—one representing her in the first quarter, one when full, and one in the third quarter; and it is proposed to publish these in a volume containing about one hundred pages of descriptive letterpress. The work will also contain a map of the moon, as we see her, and a chart, on the stereographic projection, showing the true shape and the relative dimensions of all the chief lunar features. The letterpress, map, and stereographic chart will be prepared by Mr. Proctor; the photographs by Mr. Brothers. The work will be got out on a magnificent scale, and sold at a guinea and a half to subscribers.

MESSRS. TRÜBNER announce the proposed publication of a new magazine, *The Pioneer*; a monthly journal of Sociology, Psychology, and Biology. The great aim which the *Pioneer* has in view will be "the expression of truly philosophic principles, and their application to human progress and welfare. The opinions of all will be treated with respect when expressed with the clearness and force arising from strong conviction." The subjects of "Psychic Force" and Anthropology are especially alluded to in the prospectus as coming within the range of the proposed serial.

THE Geological Expedition to the Rocky Mountain region under the charge of Dr. Hayden, to which we have already made brief allusion, according to *Harper's Weekly*, had reached Fort Hall, Idaho, on the 18th of September. After completing the survey of the Yellow Stone Valley, the party left Fort Ellis on the 5th of September, passing down Gallatin Valley to the Three Forks, and thence by the Jefferson to its very source, exploring many of its branches, and pursuing a direction nearly parallel to that which the party had traversed in the June previous. The valleys of the Gallatin, Madison, and Jefferson forks of the Missouri, with all the little branches, were found occupied by industrious farmers and miners—a contrast quite striking to the doctor, who, twelve years ago, in exploring that same region, met with not a single white inhabitant. The Rocky Mountain Divide was crossed at the Horse Plain Creek, from which the party passed over into Medicine Lodge Creek, following this down into the Snake River Plain. An interesting fact observed was the occurrence of two species of trout in great quantities in streams such as Medicine Lodge, Camas, and other creeks all sinking into the plains after a course of from fifty to seventy-five miles. The trout appeared to be of the same two species in all, although the waters had no apparent connection. The party expected to leave Fort Hall, and to proceed to Fort Bridger by way of Soda Springs, Bear Lake, and Evanston, and there to disband the scientific corps returning to the East.

IN a very important paper on the "Estimation of Antimony," published in the *Chemical News*, Hugo Tamm calls the attention of chemists to a new phenomenon which the author describes under the name of "Hygraffinity." This phenomenon was discovered in a peculiar compound of antimony—bigallate of antimony. This compound is totally insoluble in water, and yet it possesses a powerful affinity for moisture, which it absorbs rapidly from the air after being dried at the temperature of 100° Cent. Most powders and precipitates, as it is well known, dried at that temperature, absorb moisture on exposure to the atmosphere, but this is a purely physical phenomenon due to porosity. On the contrary, in the case of gallate of antimony, chemical affinity is at work, and this precipitate, after exposure to the air for two or three hours, actually absorbs two equivalents of water. In a word, this insoluble substance has as much affinity for moisture as deliquescent salts. But one of the most curious features in connection with this extraordinary phenomenon is that on being dried at 100° Cent., bigallate of antimony loses the two equivalents of water which it had absorbed from the air, and that on being left exposed once more to the atmosphere, it reabsorbs the same amount of moisture. This interesting experiment may be repeated indefinitely.

IN the *Comptes Rendus* for August and in the *Philosophical Magazine*, M. Angström gives an analysis of the spectra which are observed in connection with hydrogen, and criticises the conclusions of M. Wüllner "that hydrogen has no less than four and oxygen no less than three distinct spectra." He explains that the spectrum lines of hydrogen (as observed by Plücker in rare hydrogen) spread out in disruptive discharges when the tension of the gas is increasing, and end by uniting so as to form a continuous spectrum. With regard to M. Wüllner's second spectrum of hydrogen, he points out that it is no other than the spectrum observed by M. Berthelot and ascribed by him to *acetylene*. Also, by a comparison of wave-lengths for sulphur and for M. Wüllner's third hydrogen-spectrum, he shows this to be in all probability the spectrum of sulphur. M. Angström also points out the close agreement between one of the oxygen spectra of M. Wüllner and the spectrum of oxide of carbon, and his tables show also a very close agreement between another of these oxygen spectra and the spectrum of chlorine, and concludes that neither oxygen nor hydrogen has more than one spectrum.

PROF. YOUNG has communicated to the *Philosophical Magazine* a catalogue of more than a hundred bright lines in the spectrum of the chromosphere, in which the observed lines are referred to the scales of Kirchhoff's and of Angström's maps. Of the seventy new lines which are given in this list, there are two which are proved to belong to the chromosphere, and not to be due to the exceptional elevation of matter to heights where it does not properly belong. No less than twenty of these lines are due to the metal titanium, and show the presence of titanium vapour in the prominences and chromosphere.

THE cultivation of beet-root sugar in France has now risen to an industry of the first importance. It employs more than 400 manufactories, and the process of manufacture is each year brought to a higher state of perfection. There are in France three or four journals specially devoted to subjects connected with the manufacture, its cultivation, its sale, the machinery required, the chemistry of the process, &c.

THE Fourth Annual Report is published of the Trustees of the Peabody Museum of American Archæology and Ethnology at Cambridge, U.S.A. Two important series of explorations have been carried out in the course of the past year on behalf of the Museum, by the Rev. F. O. Dunning in Eastern Tennessee, and by Dr. Berendt in Central America, resulting in valuable acquisitions to its collections. The Museum has also been enriched during the year by the gift of the "Charles Hammond Collection" from the towns of Chatham and Rochester, Cape Cod, and by a very valuable series of about 125 objects from the conservator of the Christy collection in London, consisting of original specimens and casts from Les Eyzies, La Madelaine, and Le Moustier, in the department of Dordogne, France. The Report is accompanied by a set of comparative measurements of crania from Peru, presented by Mr. Squier, of those from the mounds of Kentucky obtained by Mr. Lyon, and from the mounds of Florida.

THE Annual *Conversazione* of the Royal Society of Victoria was held on August 14, when the president, Mr. R. L. J. Ellery, delivered an address, in which he referred especially to the scientific results of the eclipse of last winter, and the preparations making in Australia for observing the eclipse of next month, to Prof. Heis's observations on the correspondence of auroral phenomena in the southern and northern hemispheres, to Dr. von Mueller's botanical researches in the colony, to the very important subject, economically, to the colony of the preservation of meat, and to Prof. Tyndall's germ theory of disease.

THE Report is published of the Annual Meeting of the Academy of Sciences of Vienna, held on the 30th of May, 1871, containing a review of the proceedings of the various departments of the Academy during the past year. The Academy has also issued its "Almanack," with list of home, foreign, and honorary members.

A SUPPLEMENT to the Sixth and Seventh Annual Report of the "Verein für Erdkunde" at Dresden, by D. Abendroth, contains a very interesting series of maps, illustrating the extent of geographical knowledge of the world possessed at different periods from A.D. 1350 to 1566.

A WORK has come out in Holland which particularly interests those who are engaged in the treatment of sewage manure. It is by M. J. A. C. Eschauzler, and gives all the results of the centuries of experience in the Netherlands. It is copiously illustrated.

WE are informed that the German translation of Tylor's "Primitive Culture" is not by Dr. Spengel, but conjointly by Herr Spengel and Herr Poske.

A NEW class for civil engineering has been formed in the Presidency College, Calcutta.

THE Madras Government has allowed 200*l.* for the expense of bringing the Assistant Government Astronomers to England to learn celestial photography.

THE GEOGNOSY OF THE APPALACHIANS AND THE ORIGIN OF CRYSTALLINE ROCKS*

II.

THE characteristic examples already given of symmetrical and asymmetrical envelopment are cited from a great number of others which might have been mentioned. Very many of these are by the pseudomorphists regarded as results of partial alteration. Thus, in the case of associated crystals of andalusite and cyanite, Bischof does not hesitate to maintain the derivation of andalusite from the latter species by an elimination of quartz; more than this, as the andalusite in question occurs in a granite-like rock, he suggests that itself is a product of the alteration of orthoclase. In like manner the mica, which in some cases coats tourmaline, and in others fills hollow prisms of this mineral, is supposed to result from a subsequent alteration of crystallised tourmaline. So in the case of shells of leucite filled with feldspar, or of garnet enclosing epidote or chlorite or quartz, a similar transformation of the interior is supposed to have been mysteriously effected, while the external portion of the crystal remains intact. Again the aggregates of tinstone, quartz and orthoclase having the form of the latter, are, by Bischof and his school, looked upon as results of a partial alteration of previously formed orthoclase crystals. It needed only to extend this view to the crystals of calcite enclosing sand-grains, and regard these as the result of a partial alteration of the carbonate of lime. There is absolutely no proof that these hard crystalline substances can undergo the changes supposed, or can be absorbed and modified like the tissues of a living organism. It may, moreover, be confidently affirmed that the obvious facts of envelopment are adequate to explain all the cases of association upon which this hypothesis of pseudomorphism by alteration has been based. Why the change should extend to some parts of a crystal and not to others, why in some cases the exterior of the crystal is altered, while in others the centre alone is removed and replaced by a different material, are questions which the advocates of this fanciful hypothesis have not explained. As taught by Blum and Bischof, however, these views of the alteration of mineral species have not only been generally accepted, but have formed the basis of the generally received theory of rock-metamorphism.

Protests against the views of this school have, however, not been wanting. Scheerer, in 1846, in his researches in Polymeric Isomorphism,† attempted to show that iolite and aspasiolite, a hydrous species which had been looked upon as resulting from its alteration, were isomorphous species crystallising together, and, in like manner, that the association of olivine and serpentine in the same crystal, at Snarum in Norway, was a case of envelopment of two isomorphous species. In both of these instances he maintained the existence of isomorphous relations between silicates in which 3HO replaced MgO. He hence rejected the view of Gustav Rose that these serpentine crystals were results of the alteration of olivine, and supported his own by reasons drawn from the conditions in which the crystals occur. In 1853 I took up this question, and endeavoured to show that these cases of isomorphism described by Scheerer entered into a more general law of isomorphism pointed out by me among homologous compounds differing in their formulas by nM_2O_2 (M = hydrogen or a metal). I insisted, moreover, on its bearing upon the received views of the alteration of minerals, and remarked, "The generally admitted notions of pseudomorphism seem to have originated in a too exclusive plutonism, and require such varied hypotheses to explain the different cases, that we are led to seek for some more simple explanation, and to find it, in many instances, in the association and crystallising together of homologous and isomorphous species."‡ Subsequently, in 1860, I combated the view of Bischof, adopted by Dana, that "regional metamorphism is pseudomorphism on a grand scale," in the following terms:—

"The ingenious speculations of Bischof and others, on the possible alteration of mineral species by the action of various saline and alkaline solutions, may pass for what they are worth, although we are satisfied that by far the greater part of the so-called cases of pseudomorphism in silicates are purely imaginary, and, when real, are but local and accidental phenomena. Bischof's notion of the pseudomorphism of silicates like feldspars and py-

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* Address of Prof. T. Sterry Hunt on retiring from the office of President of the American Association for the Advancement of Science; abridged from the "American Naturalist."

† Pogg. Annal., lxviii. 319.

‡ Ibid.